

NOTES ON MONOSTROMA.

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THE genus *Monostroma*, as proposed by Thuret,¹ included only those species of the older genus *Ulva* that had a single layer of cells, quasi-independently located in a gelatinous membrane. Those forms with a single layer of cells, arranged parenchymatously, the same as the double layer in *Ulva*, in the restricted sense, were included in *Enteromorpha*. Under the name of *Enteromorpha Grevillei* Thuret included *Ulva Lactuca* Agardh,² and the species of the same name of Greville,³ neither of these being the *U. Lactuca* Linnaeus.⁴ Le Jolis,⁵ extends the genus *Ulva* to include *Enteromorpha*, and the species in question appears as *U. Grevillei* (Thur.) LeJolis. Wittrock,⁶ gave the genus *Monostroma* the extension that it has since held; to include all the *Ulvaceae* with a single layer of cells, arranged as a membrane, whatever the texture of the latter. The species in question here appears as *Monostroma Grevillei* (Thur.) Wittrock. Both Le Jolis and Wittrock gave the references to Agardh and Greville in the synonymy. J. G. Agardh⁷ appears to have been the first to point out that it was by no means certain that the plants mentioned by the elder Agardh and by Greville were identical, and though he gave the distinctions with considerable detail, his views do not appear to have been accepted by later writers. That there are two forms, quite distinct in their typical appearance, though possibly intermediate forms may be found, seems to the present writer to be the fact. Both occur on the New England coast, and both have been distributed in the *Phycotheca Boreali-Americana*; *M. Grevillei* as No. 15, *M. Lactuca* as No. 1271. Both are at first saccate, but the sac in *M. Grevillei* is nearly globular, in *M. Lactuca* more elongate; in the former species it soon splits into broad segments of irregular shape; in the latter into long, sublinear laciniae, often with a stipe-like base; these laciniae

¹ Note sur la synonymie des *Ulva Lactuca* et latissima L., etc. Mém. Soc. Sci. Nat. de Cherbourg, Vol. II, p. 29, 1854.

² Sp. Alg., Vol. I, p. 409, 1822.

³ Algae Britannicae, p. 172, 1830.

⁴ Sp. Plantarum, Vol. II, p. 1163, 1753.

⁵ Liste des algues marines de Cherbourg, p. 37, 1863.

⁶ Forsök till en monographi öfver algsläktet *Monostroma*, 1866.

⁷ Till Algerne Systematik, VI, *Ulvaceae*, Lunds Univ. Arsskrift, Vol. XIX, p. 101, 1882.

may be simple or forked, and usually have the edges crisped; when they are simple, there is quite a resemblance to a clump of individuals of *Enteromorpha Linza* (L.) J. Ag.; when forked, the resemblance is equally marked to *Ulva fasciata* Delile; the laciniae are sometimes quite palmately arranged. The frond of *M. Lactuca* is somewhat thicker; 20–25 μ , as against 15–20 μ in *M. Grevillei*; the structure of the former is more distinctly parenchymatous, and the texture less soft and lubricous. In a cross section of a vegetative frond the cells show much alike, horizontally elongate, occupying about two thirds of the thickness of the frond.

In Wittrock's monograph, Plate IV, fig. 14, c, represents a fruiting frond, with the characters of *M. Lactuca*; in *M. Grevillei*, as observed by the writer, the fertile portion of the frond puts on quite a different appearance; the membrane becomes thicker and more gelatinous, the cells elongate vertically to the surface of the frond, finally assuming the palisade form characteristic of *M. fuscum*, though on a smaller scale; as the spores are discharged, the membrane melts away, and there is nothing of the persistent empty tissue, shown in *M. Lactuca*, which was the principal character for the exclusion of the species from *Monostroma* by Thuret and Le Jolis. The writer does not claim the original discovery of this form of spore production; it has been noted by Rosenvinge¹ but he thinks that this is the first suggestion that it may be a distinguishing character between the two species. Specimens in this fruiting condition have been distributed as P. B.–A., No. 1467.

The question of how far related forms, evidently closely connected, are to be distinguished as species, will probably always be a matter of discussion; so much depends on the way of looking at the matter. Jónsson,² refers to the writer's arrangement of *M. Grevillei* and allied forms,³ as follows:—"I cannot admit Collins to be right in dividing *M. Grevillei* K. Rosenv. into two species: *M. Grevillei* Collins including var. *Vahlia* K. Rosenv., and *M. arcticum* Collins including var. *intestiniformis* K. Rosenv. The limit between the two species as understood by Collins, is as indistinct as the limit between the main form of the species and the included varieties. If closely related forms, which run into each other, are not to be regarded as belonging to one

¹ Grønlands Havalger, Meddelelser om Grønland, Vol. III, p. 948.

² The marine algae of East Greenland, Meddelelser om Grønland, Vol. XXX, p. 65.

³ The Ulvaceae of North America, RHODORA, Vol. V, p. 13.

and the same species, we had better take as a species every form that can be described plainly enough to be recognizable, than form species of artificially grouped forms." While this last suggestion goes too far, something near it may be temporarily admissible until we have a life history of each species, from the spore on. In the meantime it is almost as hard to draw sharp lines between *M. undulatum* Wittr., *M. pulchrum* Farlow and *M. Grevillei*, as they occur on the American coast, as it is between *M. Grevillei* and *M. arcticum*, as we understand them; for the sake of clearness it has seemed better to the writer to make more specific distinctions than Rosenvinge found expedient; in the matter of *M. Grevillei* and *M. Lactuca*, it is hoped that the new character, in the fertile frond, will render this distinction more acceptable. As this very distinct form of the fertile cell really amounts to the formation of a specialized sporangium, it would seem to place this species at the head of the genus.

At page 63 of Jónsson's work, he refers again to the writer's paper on the *Ulvaceae*, calling attention to Rosenvinge's note¹ that the cells of *M. fuscum* (Post. & Rupr.) Wittr. contain two chromatophores, one at each end; adding as a footnote, "F. S. Collins (The *Ulvaceae* etc.) does not at all mention this important character neither in the description of the species nor in the description of the genus *Monostroma*." The writer has since made a careful examination of fresh material, collected at Revere Beach, Massachusetts, the locality at which were collected the specimens distributed as Phyk. Univ., No. 64, and P. B.-A., No. 715. In every instance a single chromatophore was found in a cell. It is, of course, possible that the Greenland plant is different from the plant of the New England coast, but this is hardly likely, as the figure in Wittrock, l. c., Pl. III, fig. 11, shows a perfectly uniform chromatophore, quite like the Revere Beach plant; and this was drawn from a specimen collected in Norway. A more probable explanation is suggested by the fact that in dried specimens of green algae the contents of the cells shrink, and the remains of the chromatophores tend towards the ends, leaving the middle apparently empty; this is very conspicuous in plants with large cells, like *Chaetomorpha Melagonium* (Web. & Mohr) Kützing.

M. orbiculatum Thuret,² was not mentioned in the writer's paper on *Ulvaceae*, previously referred to, but what appears to be this species

¹ Grønlands Havalger, Meddelelser om Grønland, Vol. III, p. 940.

² Mém. Soc. Sci. Nat. de Cherbourg, Vol. II, p. 388, 1854.

occurs at Bermuda,¹ and on the Pacific coast near San Francisco, W. A. Setchell. It has fronds of a general orbicular outline, but more or less cleft and usually considerably plicate; the frond 30–40 μ thick, parenchymatous in structure, the cells angular, of irregular form, the chromatophore similar in shape but considerably smaller; cells in cross section rounded, generally vertically elongate, 25–30 μ high, the chromatophore occupying the middle part of the cell. The frond is at first attached by fibrillar prolongations from the lower cells, but soon becomes free, and floats in quiet salt and brackish waters, the same as *M. latissimum*. The texture appears to be firmer and the substance less gelatinous than in *M. latissimum*, and the dried specimen does not adhere very well to paper.

In July, 1907, the writer found at Eastham, Massachusetts, along the shore of the "Salt Pond," the expanded upper end of a long creek among the salt marshes, a plant which at first he supposed to be a new species, but which on the whole may better be included under *M. orbiculatum*. It formed rounded rosette-like masses on the mud just above low water mark; attached by the center, a single individual being as much as 25 or 30 cm. in diameter of expansion. The folds in the frond were so abundantly developed that the appearance was that of a clump of many individuals, but in each case it proved to be one plant. In appearance, the cells were like those of typical *M. orbiculatum*, but in cross section the thickness of the frond ranged from 60 μ in the lower part, to 16 μ near the margin, and the cells throughout showed either a circular or a horizontally elongate section. Quite an area of the under side in the center of the frond was furnished with the fibrillar growths from the cells, which were here larger and of more irregular shape than in the rest of the frond. It may be characterized as follows:—

M. ORBICULATUM forma **varians** n. f. Fronde eximie plicata, substrato diu affixa; in sectione transversali 50–60 μ crassa basin versus, prope marginem tenui, 16–20 μ ; cellulis in sectione plus minusve horizontaliter elongatis.

Frond extremely plicate, remaining long attached to the substratum; in cross section 50–60 μ thick near the base, thin near the margin, 16–20 μ ; cells more or less horizontally elongate in cross section. — Eastham, Massachusetts, near low water on muddy shore of marsh creek.

MALDEN, MASSACHUSETTS.

¹ Farlow in Farl. And. & Eaton, Alg. Am.—Bor. Exsicc., No. 173.